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Pest Control Device and Method

The invention relates to a method and a device for trapping flying insects and similar small pests.

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Fly traps that incorporate sticky trapping surfaces that are positioned on windows are well known in the art. Such devices use natural light coming through the window to attract flying insects and, if the insects contact the sticky paper, the insects are trapped.

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An early example of such a fly catcher is that described in US 560,040. In US 560,040, a transparent glass plate that is covered in a sticky material is placed against a window. Flying insects become trapped in the sticky material if they contact it.

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A problem with the device disclosed in US 560,040 is that a glass plate having insects trapped thereon is unsightly.

This problem is addressed to a certain extent by US 5,022,179 and US 5,815,981.

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In US 5,022,179, a sticky surface is positioned at right angles to a window and an additional panel, parallel to the window, obscures the sticky surface from view.

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In US 5,815,981, a V-shaped trough is located on a windowsill. The internal sections of the trough are covered in a sticky substance. As with the device of US 5,022,179, the sticky surface is obscured from view such that trapped insects cannot readily be seen.

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An alternative approach to trapping flying insects is disclosed in EP 0 586 432. In EP 0 586 432, UV lamps are used to attract flying insects into a trap. The trap consists of an adhesive substrate on which the insects are trapped. An advancing mechanism is provided such that the adhesive substrate can be intermittently advanced such that a fresh portion of the substrate is available to trap more insects.

10 There are a number of problems associates with known traps for flying insects that make use of natural light to attract the insects.

As described above, many of the traps are unsightly when a significant number of insects have been trapped. As discussed above, this problem has been at least partially addressed by some prior art devices.

Many devices which make use of natural light to attract flying insects rely on flying insects randomly coming into contact with the sticky surface of the trap rather than the ordinary window; such traps are inefficient. This problem is at least partly addressed in some of the prior art devices by providing a further method of attracting the insects into the trap itself, such as impregnating the trapping adhesive with a scent that attracts insects.

Many of the prior art devices use a simple sticky substrate, perhaps shielded from view, that traps insects that contact it. Such a device suffers from at least two problems. First, the substrate must be regularly replaced.

Second, the trapped insects represent a hygiene hazard before the substrate is replaced.

The device and method of the present invention seeks to
5 overcome or mitigate at least some of the problems identified above.

The present invention provides a method of trapping flying insects comprising the steps of placing a trap at or near
10 the interior surface of a window and relying on ambient light passing from the exterior to the interior of the window to attract flying insects to the interior surface of the window for trapping, including the provision, in the trap, of a panel through which insects can pass and an
15 adhesive substrate so positioned in relation to the panel that an insect passing through the panel encounters the adhesive substrate, the panel being so positioned in relation to the interior surface of the window as to permit an insect moving along the interior surface of the window
20 towards the panel to pass through the panel, the method further including the provision of an adhesive substrate in a form permitting the adhesive substrate to be advanced to replace a used portion by a fresh portion and the step of advancing the adhesive substrate to replace a used portion
25 by a fresh portion.

The present invention also provides a device for trapping flying insects, the device comprising a panel through which insects can pass and an adhesive substrate so positioned in
30 relation to the panel that an insect passing through the panel encounters the adhesive substrate, the adhesive substrate being provided in a form permitting the adhesive

substrate to be advanced to replace a used portion by a fresh portion, the device further comprising means for advancing the adhesive substrate to replace a used portion by a fresh portion, wherein, in use, said device is placed
5 at or near the interior surface of a window and relies on ambient light passing from the exterior to the interior of the window to attract said flying insects to the interior surface of the window for trapping.

10 The method and device of the present invention have a number of advantages. The device makes use of natural light coming through a window to attract flying insects in a straightforward manner. Further, the provision of a adhesive substrate within the trap enables the insects to
15 be securely trapped and out of sight, especially once the adhesive substrate has been advanced to replace a used portion with a fresh portion.

The adhesive substrate may be provided in the form of a
20 roll of adhesive material, but other forms are possible, such as a continuous band of the adhesive material.

In a preferred embodiment of the invention, the device is placed near the base of the interior surface of the window
25 for trapping insects moving towards the base of the window. Thus, flying insects that hit the window and drop down are caught by the trap. Furthermore, in one form of the invention, the device is positioned substantially at right angles to the window.

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Control means may be provided to enable the adhesive substrate to be advanced intermittently at predetermined

intervals, such as once per week. Alternatively, control means arranged may be provided to advance the adhesive substrate incrementally on a regular basis, for example the substrate may be advanced by a small amount once per hour.

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The control means may be provided with an override to enable a user to advance the substrate. For example, a maintenance engineer may wish to advance the substrate during maintenance. Further, a user may wish to advance
10 the substrate at more regular intervals than as provided in a manufacturers setting.

The window may have insecticide applied thereto. The insecticide may be used to stun or kill insects that
15 contact the window, with the stunned or killed insects dropping into the trap.

In one form of the invention, the panel is a louvered panel. In this form of the invention, the insects fall
20 through the louvered panels and the louvered panels prevent the trapped insects from being seen.

In one form of the invention, the panel includes elongated flaps positioned along the length of the trap to channel
25 said insects towards said adhesive substrate. This arrangement has the advantageous effect of channelling insects so that the area of the trap being largely than the area of the adhesive substrate.

30 The device may emit pheromones into the atmosphere immediately surrounding the substrate, thereby attracting insects towards the trap.

The substrate may form part of a cassette, which is removable from the remainder of the device. This has advantages for the maintenance of the device. The panel
5 may form part of said cassette.

In embodiments of the invention in which the substrate is the form of film or foil, one surface of the substrate may be adhesive substantially throughout its length. The other
10 surface of the substrate may be a release surface.

The adhesive may comprise poly-butenes.

The device may comprise means for crushing insects adhering
15 to the substrate so as to flatten them onto the substrate.

The device may comprise means for removing insects adhering to the substrate. This device may take the form of a knife or a brush.

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Several pest control devices and methods in accordance with the invention will now be described, by way of example only, with reference to the accompanying drawings in which:

25 Fig. 1 is an isometric view of a pest control device in accordance with a first embodiment the present invention, the device being positioned against a window;

Fig. 2 is an isometric view of the pest control device of Fig. 1 in isolation;

30 Fig. 3 is a cross-section of the pest control device of Figs. 1 and 2, taken along the line A-A of Fig. 2, showing the substrate in an early stage of use;

Fig. 4 is a cross-section of the pest control device of Figs. 1 and 2, taken along the line A-A of Fig. 2, showing the substrate in a later stage of use;

Fig. 5 is an isometric view of a pest control device
5 in accordance with a second embodiment of the present invention;

Fig. 6 is an enlarged, exploded view of one end of a pest control device in accordance with an aspect of the present invention;

10 Fig. 7 is a view of the end of a pest control device in accordance with an aspect of the present invention, with the end being partly cut-away;

Fig. 8 is an exploded view of the drive mechanism of a pest control device in accordance with an aspect of the
15 present invention;

Fig. 9 is a view of the end of a pest control device in accordance with an aspect of the present invention, with the drive mechanism moved to a second position to provide access to that mechanism; and

20 Fig. 10 is a photograph of a pest control device in accordance with the present invention.

Figures 1 to 4 show a pest control device 2, in accordance with the present invention. Figure 1 shows the pest
25 control device 2 in a normal operational position against the internal surface of a window 4. Light coming in through the window 4 is used to attract flying insects towards the window.

30 An insecticide is provided on the window 4 to stun or kill any insect that comes into contact with the window. The

stunned or killed insect then falls into the pest control device 2.

5 A number of methods of applying such an insecticide to a window are known. These include using a pen and using a pad. The use of a pad to apply insecticide to a window is particularly convenient, especially when regular cleaning of the window means that the insecticide must be reapplied regularly.

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The pest control device 2 includes a louvered panel, indicated generally by the reference numeral 6, the louvered panel 6 having a number of slots 6a, 6b ... 6n. An insect that has been stunned or killed after coming into
15 contact with the insecticide on the window 4 drops towards the device 2 and falls through one of the slots 6a, 6b ... 6n into the interior of the pest control means 2.

Figures 3 and 4 are cross-sectional views of the pest
20 control means 2 taken along the line A-A of Figure 2. Figure 3 shows the interior of the pest control means 2 in an early stage of use: Figure 4 shows the interior of the pest control means in a later stage of use.

25 In the interior of the pest control means 2, a substrate 8 is provided. The substrate has a sticky surface that is used to trap insects that fall through the slots 6a, 6b ... 6n. The area of the substrate 8 that is located below the slots 6a, 6b ... 6n is termed the exposure zone 9. The
30 substrate 8 extends between a first storage means 10 and a second storage means 12 through the exposure zone 9. The first and second storage means 10 and 12 each comprise a

rotatably mounted shaft 11 and 13 respectively. The substrate 8 extends from a supply roll 14 on the shaft 11 to a take-up roll 16 on the shaft 13. First and second guide rollers 18 and 20 respectively are provided to guide the substrate 8 from the supply roll 14 to the take-up roll 16.

An electric motor (described below with reference to Figures 7 to 9) is operable to rotate the shaft 13 to advance successive portions of the substrate 8 from the exposure zone 9 onto the take-up roll 16, at the same time drawing fresh unused portions of the substrate 8 from the supply roll 14 into the exposure zone 9. The pest control means 2 is provided with a control means (not shown) to activate the motor at predetermined intervals, for example once per week (of course, of frequencies could be used).

A spring loaded crusher bar 22 mounted on the shaft 13 is provided to press against the substrate 8 as it is wound onto the shaft 13 in order to flatten insects onto the substrate. The crusher bar 22 is so mounted that it can move outwards away from the shaft 13 as the size of the roll 16 increases.

Fig. 3 shows the substrate 8 in an early stage of use in which most of the substrate 8 is in the supply roll 14 and only a small portion is wound onto the shaft 13. Figure 4 shows the substrate 8 in a later stage of use in which only a small portion of the substrate remains on the shaft 11 and most of the substrate is in the take-up roll 16 on the shaft 13. As shown in Figures 3 and 4, the diameter of the take-up roll 16 when it comprises substantially all of the

substrate 8 is greater than of the supply roll 11 when it comprises substantially all of the substrate 8 due to the presence of trapped insects on the substrate forming the roll 16.

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Figure 5 shows a pest control device, indicated generally by the reference numeral 30, in accordance with a second embodiment of the present invention. The pest control device 30 comprises a two elongated flaps 32 and 34, a main body 36, end caps 38 and 40, a supply roll 42 and a take-up roll 44. In use, a substrate extends from the supply roll 42 to the take-up roll though an exposure zone, indicated generally by the reference numeral 43.

15 Flaps 32 and 34 are used to channel insects that fall towards the device 30 towards the exposure zone 43; this effectively extends the area over which the device 30 operates, without extending the area of the exposure zone. Further, one of flaps 32 and 34 can be pushed firmly
20 against the window with which the device 30 is being used to ensure that no insects fall between the device 30 and the window. Of course, similar flaps could be used in conjunction with the device 2 described with reference to Figures 1 to 4.

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Figures 6 to 9 show a number of features of the pest control device 30. Each of those features could also be applied to the pest control device 2 described with reference to Figures 1 to 4.

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End caps 38 and 40 are attached to the pest control device 30 by means of an interference fit, as shown in Figure 6.

An electric motor 48 is operable to rotate the take-up roll 44 to advance successive portions of the substrate from the exposure zone 43 onto the take-up roll, at the same time drawing fresh unused portions of the substrate from the supply roll 42 to the exposure zone 43. As with the pest control device 2 of the first embodiment of the invention, a control device (not shown) is provided to activate the motor at predetermined intervals, for example once per week.

Motor 48 drives a reduction gear mechanism comprising gears 45 and 46 and spindle 52, as shown in Figures 7 and 8. Spindle 52 is driven by motor 48 and rotates the take-up roll 44. Bosses 50 (only one is visible in Figure 8) secure the spindle 52 to a drive assembly 54. Drive assembly 54 houses motor 48, gears 45 and 46, bosses 50, spindle 54 and take-up roll 44. The drive assembly 54 can be splayed to release the spindle 52 from bosses 50 and hence release the take-up roll 44. The drive assembly 54 can also be rotated as shown in Figure 9 in order to give access to the drive system of the pest control device 30.

The pest control device 30 is used in a similar manner to the pest control device 2. Both pest control devices 2 and 30 are positioned against a window, with light coming through the window being used to attract flying insects towards the window.

Both pest control devices 2 and 30 make use of an insecticide provided on the window to stun or kill any insect that comes into contact with the window, as

described above. In the case of the pest control device 30, the stunned or killed insects are guided by flaps 32 and 34 to the substrate in the exposure zone 43. Of course, a louvered panel such as that of pest control device 2 could be added to the pest control device 30.

The pest control devices 2 and 30 may be so arranged that insects adhering to the substrate are removed as the substrate is advance from the exposure zone to the take-up roll 12, 44. This may be achieved by mechanical means, for example, a blade located close to the substrate as it passes from the exposure zone, or a brush in contact with the substrate. Preferably, such a device is provided with collection means for the insects removed from the substrate, the collection means being arranged to retain the insects within the device.

The first and second storage means 10 and 12 of the pest control means 2 may be formed as a unit, or cassette, the cassette being removable from the remainder of the device. With such a device, when it is necessary or desirable to replace the substrate 8, the cassette can be removed from the remainder of the device 2, which can be left *in situ*. The substrate 8 may then be taken out from the storage means, a fresh substrate installed, and the cassette returned to the device 2. Alternatively, the entire cassette may be replaced by a similar cassette, which includes a fresh substrate. Either of those arrangements greatly facilitates the servicing of the device. The cassette may also include at least a portion of housing that forms part of the first and second storage means 10 and 12. The pest control means 30 in accordance with the

second embodiment of the invention may be provided with a similar cassette.

The pest control devices 2 and 30 may include means for
5 applying pheromones, or other substances that attract
insects to the substrate or means for emitting such
substances into the atmosphere immediately surrounding the
substrate. The said means may comprise one or more
pheromone sources arranged to contact the surface of the
10 substrate as it is advanced from the first storage means,
and for that purpose the sources may be provided with, for
example, roller-ball applicators. Alternatively, the said
means may comprise one or more pheromone sources, each of
which is arranged to emit a plume of pheromones into the
15 atmosphere immediately surrounding the substrate, and for
that purpose the sources may be provided with porous
filters, or the sources may be in the form of phials, each
of which is designed to release a plume of a continuous
stream of molecules. Thus, it is possible to select a
20 pheromone or a combination of different pheromones
depending on the insects that it is intended be trapped by
the device. For example, in a cigarette factory, a
cigarette beetle pheromone would be appropriate. An
analysis of the insects adhering to the substrate, which
25 can be made during the inspection referred to above,
enables the appropriate pheromones to be selected. When
the device comprises a cassette, one or more sources of
pheromones are advantageously mounted in or on the
cassette, so as to be removable for servicing with the
30 cassette.

When the substrate is in the form of a film or foil, one surface of the substrate may be adhesive throughout its length, although a zone extending along the length of the substrate may be left free from adhesive to facilitate driving, or for other purposes, and a zone at the front end of the substrate may be left free to facilitate installation of the substrate. It is also within the scope of the invention to arrange that an adhesive composition from an adhesive reservoir is applied to the substrate at a location between the first storage means and the exposure zone, and when the substrate is in the form of a web of woven material or netting such an arrangement is preferred.

The adhesive composition may be a viscous, non-drying, pressure-sensitive adhesive, for example, a poly-butene based material, especially, a poly-n-butene/poly-iso-butene based material. The adhesive composition may contain one or more substances that attract insects, for example, pheromones.

When one surface of the substrate is adhesive, the other surface of the substrate may be a release surface, which may be provided by a release coating on the said other side of the substrate. In another arrangement, a separate release sheet may be provided, which is arranged in contact with the adhesive surface of the substrate in the first storage means.

The control means in either the pest control means 2 or the pest control means 30 may be provided with an override, which causes the control means to activate the motor and advance the substrate.

The pest control means 2 and 30 may be powered using batteries. Alternatively, or in addition, the pest control means 2 and 30 may be solar powered.

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Figure 10 is a photograph showing a prototype of a pest control device in accordance with the present invention located against a window.